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PSYCHOLOGICAL AND EDUCATIONAL TESTS

in

THE PUBLIC SCHOOLS

of

WINCHESTER, VIRGINIA

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A Report

to the

City School Board and the Handley Board of Trustees

of an

Investigation Conducted

by

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and

Dr. ALEXANDER INGLIS, *Harvard University*

With the cooperation of

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Dr. G. O. FERGUSON, *University of Virginia*

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Mr. W. L. PRINCE, *Virginia State Department of Education*

Mr. L. A. MAVERICK, *Harvard University*

Dr. C. H. WESTBROOKS, *Harvard University*

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## FOREWORD

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As a result of the Survey of the Winchester Public Schools made by the General Education Board of New York City published in 1918 under the title "A Report of the Handley Fund, Winchester, Va." a program of reorganization and improvement of the Public Schools of Winchester was determined upon by a joint conference of the School Board, the Handley Trustees, and the City Council, by virtue of which the details of the plans of reorganization and improvement were to be left in the hands of a Superintendent of Schools, to be selected by a joint board to consist of the members of the School Board and the Handley Trustees.

The Superintendent was selected in June 1919 and an immediate conference was called to consider ways and means of conducting an educational survey of school conditions in Winchester in order that a comprehensive and scientific basis for improvement might be established. As a result of this conference it was decided to institute an intensive study of not only the methods of education in the Winchester schools but to pay especial attention to the achievements and capacities of the school children. Dr. W. F. Dearborn and Dr. Alexander J. Inglis of Harvard University were then invited to confer with the members of the School Board concerning plans for a program of psychological and educational tests to determine the facts desired.

Following this conference active work upon this investigation was begun in November 1919, and the field work completed by the end of December. A preliminary report was made in January and a program of reorganization was agreed upon. Detailed information on the abilities and achievements of each pupil in the school system, together with recommendations upon each one was placed in the hands of the Superintendent of Schools and steps were at once taken to reorganize the school system upon the basis of these reports and recommendations.

The investigation was planned by Dr. Dearborn and Dr. Inglis of Harvard University, and carried on under the joint co-operation of the University of Virginia, the Virginia State Department of Education, and the officers and staff of the Public Schools of the City of Winchester.

F. E. CLERK,

*Superintendent of Schools.*

## INTRODUCTION

The University of Virginia through its Bureau of Extension is endeavoring to co-operate as far as the meager means at its disposal will permit with any agency or organization which has for its object the promotion of the common welfare. Members of the faculty of the University render assistance in making scientific investigations and surveys and through the Division of Publications the results of such investigations and surveys are published and the information disseminated amongst groups of people who would be interested in the specific subject of investigation.

Upon invitation of the City School Board and the Handley Board of Trustees of the City of Winchester, two members of the faculty of the Department of Education co-operated in a study of the Winchester schools with special emphasis upon the achievements and capacities of the school children. Believing that a report of the results of this investigation will be of special value to school officials in the other cities and in the counties of the State and the University will render a further service by publishing the results, the Bureau of Extension is co-operating with the Handley Board of Trustees in publishing and distributing the report.

CHARLES G. MAPHS, *Director,*  
*Bureau of Extension.*

University, Virginia,  
December 23, 1921.



## CHAPTER I

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### THE PURPOSE OF THIS INVESTIGATION.

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No problem of education is more important than that which involves the adaptation of instruction to the capacities and needs of the children who are to be educated. Every parent for the sake of his children, every citizen for the sake of society, every teacher for the sake of her pupils, and every school officer as a measure of the education provided should ask these questions: Is each child in the school located in the grade and class best suited to him? Are subject matter and methods of instruction properly adapted to his capacities and to his stage of progress? Is the school so organized that, within necessary limits, each child may progress in his education at the rate demanded by his individual abilities and needs? Have all reasonably possible means been employed to classify pupils in instructional groups according to their various capacities?

Obviously, before these and similar questions can be answered one must know not only what the schools are doing but also he must know the real capacities and needs of each pupil. Before he can determine whether any given pupil is located in that grade and instructional group best fitted to his capacities and needs one must ascertain what those capacities and needs are. Before instruction can be adapted properly to the pupils' abilities it is necessary to determine that to which it is intended to adapt instruction. Before one can find out whether a pupil is progressing as he should one must learn how fast he is capable of progressing. Before pupils can properly be classified in instructional groups according to their various capacities one must discover the relative capacities of the children concerned and set up standards for classification. A primary condition of the proper organization of instruction is a careful analysis of the character of the pupils to be instructed.

If all children of the same degree of maturity, or even those who have received the same kind and amount of training, were capable of being educated in the same way, to the same degree, and at the same rate, the problems of education would indeed be difficult enough, but they would be infinitely more simple than they really are. The facts are, however, that (chronological) maturity is a very unsafe indication of capacity and that no amount of similar education can make children alike. Pupils of the same (chronological) age and of the same degree and kind of education differ in almost every conceivable way. They differ in the limits which nature has set to their learning,

in the ways in which they can learn, in what they can learn, and in the rates of their learning. No effective organization of instruction can ignore the fundamental fact that children differ widely in their capacities and needs.

Every one recognizes the fact that individuals differ in mental traits even more than in physical traits. The extent and character of such differences, however, and the importance of those differences for education, are rarely appreciated by the average citizen and are seldom properly recognized even by the teacher or school officer. Research within the past few decades has shown clearly that the greatest problems of education at the present time center around the fundamental differences among pupils in almost all those traits which most seriously condition their education.

In the public school the limitations of resources and a reasonable regard for economy in the expenditure of public funds have caused the grouping of pupils for purposes of instruction in classes the size of which in cities commonly runs as high as thirty or more pupils. Usually pupils are grouped in classes almost entirely on the basis of their accomplishment of the work of the preceding grade and without regard to the widely differing capacities of the children. As a result in most schools one may find pupils ranging all the way from feeble-mindedness to genius grouped in the same class and receiving the same kind and amount of instruction. It is the rule rather than the exception to find in the same class and provided with exactly the same instruction pupils of widely varying capacities.

This practice of grouping together for purposes of instruction pupils of low mentality, of average mentality, and of superior mentality presents a situation in which effective education is impossible. In such a class the teacher is compelled to do one of three unjustifiable things. He may adapt instruction to the average pupil, overburden or neglect the slower pupil, and underburden or neglect the brighter pupil; he may adapt instruction to the slower pupil in the attempt to bring all pupils up to a minimum level, with the result that both the average pupil and the brighter pupil work far below their capacities and develop habits of intellectual laziness; he may take pride in and adapt instruction to the brighter pupil, overburdening and neglecting the slower pupil and the average pupil. Usually he adopts the first of these possible practices, so that the slower pupils fail, become discouraged, and are retarded or eliminated, while the brighter pupils develop pernicious habits of working far below their capacities and are held back in their education. Educationally the practice cannot be justified. It is to be tolerated at all only where conditions beyond the control of school authorities render any other course impossible, i. e., in very small schools. Present practice has much to answer for in the discouragement and elimination of slower pupils and in the delayed and limited education of brighter pupils.

In part the practice of grouping pupils primarily according to achievement in earlier grades has been based on the hypothesis that, while pupils may differ noticeably when they enter the school, like forms of instruction given to all pupils in a given grade would tend to result in an increasing homogeneity, making possible instruction in common, and that relatively equal stages of pedagogical achievement afforded a proper and adequate measure of capacities. Recent psychological research, however, has established two important facts: first, that from birth nature sets for each individual certain limits up to which but not beyond which he may go, while experience and education can only determine how far the individual will go within those limits set by nature; secondly, that where individuals differ at the outset, original differences are not reduced by the same kind and amount of training, but rather tend to increase. This means that from the beginning nature has determined what each pupil can learn, how much of it he can learn, how he can learn it, and at what rate his learning may proceed, just as surely as nature has determined how tall an individual can grow, how far he can see, what he can hear, and how fast he can run. By no form of educational machinery can the pupil of low mentality be brought to learn the same things, to the same degree, in the same way, and at the same rate as the pupil on whom nature has conferred superior mentality. To ignore that fact is to commit an educational crime, primarily against the individual child. Few sights are more pitiable in the school than that of the pupil to whom nature has denied the necessary capacity compelled to attempt school tasks entirely beyond his powers. On the other hand, parents and others are rightly incensed when they see pupils of superior mentality compelled to mark time and develop habits and standards of inferior accomplishment. Beyond question one of the most important reforms needed in our system of education is that of improving the present methods of class grouping and, as far as may be possible, of adapting instruction to pupils of different capacities.

This form of grade classification is common in all parts of the country. It was carefully studied in the Virginia Survey. A part of the report of that Survey is as follows:

That educational work in Virginia suffers from such incongruous grouping of children is easy of demonstration. Particular attention will be given to this subject in the special report on tests and measurements, but certain illustrative cases may be given here. The Survey has available for a study of this situation not only the results of the group examinations, but also individual examinations on about 2,000 children. These individual examinations were made with the Stanford-Binet tests and the results are stated in terms of the mental age of the individual children, a mental age of six meaning a mentality equal to that of the average six year old child.

To illustrate a common situation, we may take the Glen Allen School in Henrico County. The third grade of this school is com-

posed of twenty-eight children all of whom were examined with the Stanford-Binet tests. The median chronological age of the group is 10.2 years. The median mental age is 9.5. It is therefore an approximately normal mental group. There is, however, one child in the group who has a mental age of 8.1 years, and another whose mental age is 12.4, the other children being of different mental ages between these two extremes. There is a mental difference between the two children mentioned equivalent to the mental growth which a normal child makes in four years. It does not require much insight to know that these two children require different teaching methods. One of them is the equivalent of an average second grade child, and the other is equal to an average child in the sixth grade.

The condition of this Glen Allen class is not peculiar. In grade 1B of the Ginter Park School (Richmond) there is one child with a mentality of 11 years and 3 months, and another whose mentality is that of a child nine years and seven months old. In the Highland Springs fifth grade of forty-six pupils, nine read equal to the Thorndike Standard for the third grade, and five others read equal to the standard for the sixth grade. Somewhat similar conditions can be found in practically any school.

The 5A class of twenty pupils in the Midway School at Charlottesville has four pupils who score 38 or less, which is about third grade ability, and it has one child who scores 94 or approximately sixth grade quality. Of fifteen pupils in the 5B class in one Portsmouth school five pupils score 95 or better, about sixth grade standard, and three pupils score below 70 (below the fifth grade standard). Of fifteen 5B pupils in the Commerce Street School of Roanoke four have scores equal to sixth grade score or better, and there are three as low as or lower than the fourth grade median. The distribution is greater in the rural schools than in the cities. Of seven hundred twenty-three pupils in fifty-five schools having four or more rooms, 46 are below the third grade median; 146 are between the third and fourth grade medians; twenty-one are as good as the seventh grade medians; and twenty-five others score equal to the sixth grade or beyond. The remaining 450 are between the fourth grade median and the sixth grade median. Yet all of these pupils are ranked as fifth grade pupils and must follow the same course of study and are expected to complete it in two additional years. Forty-six of them under good conditions could complete it in one year. For forty-six others it will require four years. Situations of this sort can be shown for any grade and in almost any class examined.

Radical and definite steps should be taken for improvement. First of all there should be an improvement in the methods of determining the classification. It is not enough that a child has reached a certain age, that he has been in school a certain number of years, that he has followed a particular course of study and passed the examinations set by his teachers. All of these matters are important but the knowledge which a teacher gets about a child from these sources should be supplemented by the pupils' scores in standard achievement tests, particularly in reading, and by his scores in mental tests where these can be effectively given. If teachers and principals will learn to use these standard mental and achievement tests they will be better able to group pupils according to capacity than they are now doing.<sup>1</sup>

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<sup>1</sup> Virginia Public Schools—Education Commission Survey and Report pp. 126—128.

The Virginia Survey showed clearly that in Virginia, as in most parts of the country, the classification of pupils by grades and instructional classes is very defective; that poor grouping of pupils renders effective instruction impossible; that the organization of instruction is such that the slower pupils and the brighter pupils constantly suffer, the former because they are compelled to attempt work far beyond their capacities, the latter because they are constantly held back in their education; and that necessary provision for individual differences among pupils is lacking.

What is the situation in Winchester? Are these defects also found in the schools of that city? To the educational expert the most casual observation would indicate that all of those defects are to be found in the Winchester Schools. The situation is analyzed in detail in Tables 7 to 31 of Appendix, and considered carefully in Chapter III. It is not out of place here, however, to anticipate somewhat the facts there considered and to point out that in Winchester, as in most cities of the country, there is great need of reform in the classification of pupils and the adaptation of instruction to the capacities and needs of certain distinguishable groups of pupils. That need may be seen from the following facts:

(1) In the first grade of Winchester Schools at the present time the chronological ages of pupils vary all the way from five years and eleven months to twelve years and three months, while the mental ages of pupils in that grade vary all the way from five years and two months to eight years and eleven months. The lowest pupil has an intelligence quotient of .50 (equal only to that of the average feeble-minded child), while the highest pupil has an intelligence quotient of 1.20 (twenty points above the average child).

(2) Differences between the mental ages of pupils of about the same chronological age (about seven years) may be seen from the following cases selected from the first grade of the Winchester Schools:

TABLE 1

Showing differences in mental age of pupils of approximately the same chronological age (7 years)

Pupil numbered	Chronological Age	Mental Age
114	7 yrs. 2 mos.	5 yrs. 2 mos.
29	7 " 3 "	5 " 6 "
110	6 " 9 "	6 " 0 "
106	7 " 3 "	6 " 6 "
23	7 " 0 "	6 " 10 "
93	6 " 11 "	7 " 7 "
77	6 " 11 "	7 " 10 "
61	6 " 11 "	8 " 6 "

Pupil number 61 is three months younger than pupil number 114 in chronological age, but is more than three years older mentally.

(3) First-grade pupils of about the same mental age vary widely in chronological age, e. g.:

TABLE 2

Pupil Numbered	Mental Age	Chronological Age
89	7 yrs. 2 mos.	6 yrs. 3 mos.
22	6 " 10 "	7 " 0 "
64	7 " 2 "	7 " 5 "
121	7 " 0 "	8 " 5 "
33	7 " 2 "	10 " 7 "

Pupil number 89 is of the same mental age as pupil number 33 but is more than four years younger.

(4) In Table 6 are presented figures which show for each grade of the elementary school the ranges of pupils (a) in chronological age, (b) in mental age, (c) in intelligence quotients. Those figures show that in no grade is the range in chronological age less than six years, that in no grade is the range in mental age less than three years, and that in no grade is the range of intelligence quotients less than .55.

(5) Pupils of mental ages nine years and eight months to nine years and eleven months are found in every grade of the school from the second to the eighth.

Such facts as those presented show clearly that the grade classification of pupils in the Winchester Public Schools is not well adjusted to the general capacities of pupils. It is also true that it is not well adapted to the special abilities of pupils in school subjects. This is shown by the facts indicated below.

(1) Table 16 shows that some pupils are found in every grade from the third to the eighth who received a score of zero on the Curtis Standard Tests in addition, and that pupils are found in the third grade who do as well as the average of the eighth grade in this test in addition.

(2) The same table also shows that pupils are found in every grade from the third to the seventh who received a score of zero on the Curtis Standard Tests in subtraction. It also shows that pupils are found in every grade from the third to the eighth who received a score of four on the same tests.

(3) Table 17 shows that pupils are found in every grade from the third to the seventh who received a score of zero in multiplication on the Curtis Standard Tests and that pupils are found in every grade from the fourth to the eighth who received a score of five on the same tests.

(4) Table 17 also shows that pupils are found in every grade from the third to the eighth who received a score of zero in division on the Curtis Standard Tests and that pupils are found in every grade from the fifth to the eighth who received a score of six on the same tests.

(5) Table 14 shows that pupils are found in every grade from the third to the eighth who received a grade of from 51 to 60 on the Monroe Reading Tests. It also shows that the best pupil in the third grade did as well as from half to three fourths of the pupils in the fourth and fifth grades and better than some pupils in the eighth grade.

These facts show that relatively ineffective instruction will be provided in the public schools of Winchester as long as the present situation continues. They show that the attempt is being made to educate pupils of very widely differing capacities in the same instructional classes, in the same way, in the same amount, on the same materials, and at the same rate. This is totally impossible and the attempt can only result in loss to most of the pupils. There is imperative need in Winchester for the establishment of a new method of classifying pupils in grades, classes, and sections; for modification in the methods of instruction according to the varying capacities and needs of the different groups of pupils; for a more flexible system of promotion and grade articulation, and for recognition of pupils' differences in other ways.

Before these reforms can be achieved it is necessary to ascertain the capacities and needs of each pupil in the school. Hence the purpose of this investigation is the determination of the capacities, abilities, and needs of all pupils in the Winchester Schools, and the furnishing of the best possible information, so that (a) there may be established an improved method of classifying pupils in grades, classes, and sections; (b) teachers and school officers may have available the data necessary for the adaptation of instruction to the capacities and needs of pupils in various grades and classes; (c) material may be available for the intelligent guidance of pupils in their school work; (d) systems of promotion and grade articulation may be improved; (e) all reasonable provision may be made for recognizing individual differences among the pupils.

## CHAPTER II.

## THE METHODS OF THIS INVESTIGATION.

In the past the capacities of pupils in the school have been estimated almost entirely on the basis of the teachers' judgments, particularly as determined by the accomplishments of pupils in school studies. Such judgments by teachers are always valuable and must always be considered. Experience has shown, however, that they are very far from being infallible and that when reliance is placed on those judgments alone grave injustice is frequently done to many pupils. They must, of course, always be open to several defects. In the first place, they are personal and individual judgments, the validity of which must vary according to the ability of teachers to judge the most difficult of all things—mental capacities, whose nature is so complex that the most searching study must be made of every pupil as an individual before one may be sure of the judgment. Some teachers, especially those with extended experience, may be very good judges of capacity, while others are very clearly poor judges. In any case the judgment must be subject to the limitations of any individual judge. In the second place, the judgments of teachers are primarily determined by the accomplishment of pupils in school studies, a criterion which is not always satisfactory, in part because accomplishment is a resultant of two factors or three factors accordingly as capacity, interest, and industry are combined in varying degrees, and in part because pupils of different degrees of maturity are commonly compared on the same basis. Obviously a ninety per cent achievement in any school subject by a pupil ten years of age means a mental capacity far different from a ninety per cent achievement in the same subject by a pupil thirteen years of age. A ten-year-old child who can perform correctly seven examples in arithmetic in the same time that a fourteen-year-old child can perform the same seven examples possesses a capacity far above that of the latter. The common practice of judging capacity in terms of accomplishment only is very unsatisfactory, as is clearly shown by the grade classifications and promotional systems found in most schools.

Within recent years has been developed a new method of judging the capacities and achievements of children and numerous tests have been devised for the measurement thereof. Those tests differ from the older tests in that they have been standardized on the basis of the reactions of thousands of children so that we know what may be expected of children of each age and grade of school progress for normal children, for those of limited capacity, and for those of superior mentality. Those tests have the important advantage over the



teacher's judgment that they are purely objective and unaffected by personal opinion or by the limitations of the teacher's capacity to judge accurately the capacities or achievements of the child. They have the added advantage that they compare children of the same degree of maturity with each other and avoid the dangers of unfair comparison mentioned in the preceding paragraph.

Such standardized tests were given to all children in grades one to eight of the Winchester Schools and interpreted in comparison with the present classification of pupils in various grades as well as with the teachers' estimates of each pupil's intelligence, scholarship, and industry. The following means were employed in the investigation to determine the capacities of pupils: (1) group intelligence tests; (2) individual intelligence tests; (3) achievement tests in certain important school studies; (4) teachers' estimates of the pupils' intelligence, scholarship, and industry.

#### I. GROUP INTELLIGENCE TESTS.

During the week of November seventeenth group intelligence tests were given to all pupils in grades one to eight. The total number of tests given was seven, no pupil receiving less than three different group intelligence tests. For convenience they are designated here G-1, G-2, G-3, G-4, G-5, G-6, G-7. Of these G-1, G-2, G-3 were tests which, with some changes and additions, now constitute Series I of the Dearborn Group Tests of Intelligence.<sup>1</sup> G-4, G-5, and G-6 included parts of several standard psychological tests, several tests now a part of Series II of the Dearborn Group Tests of Intelligence,<sup>1</sup> and certain other psychological tests developed in the Harvard Psychological Laboratory. G-7 was the Alpha Tests of the Army Psychological Examination. All of these tests were standardized and graduated according to the plan indicated below wherein are chosen the grades in which each test was given.

<i>Grade</i>	<i>Tests Given</i>						
1	G-1	G-2	G-3				
2	G-1	G-2	G-3				
3	G-1	G-2	G-3	G-4			
4	G-1	G-2	G-3	G-4	G-5		
5				G-4	G-5	G-6	
6				G-4	G-5	G-6	G-7
7					G-5	G-6	G-7
8					G-5	G-6	G-7

Each pupil was given three or more different intelligence tests, to avoid, as far as possible, the contingency that a chance failure or

<sup>1</sup> These tests are now published by the J. B. Lippincott Company, Philadelphia.

success in any one test might misrepresent the pupil's true capacity. Such a contingency was further avoided by the fact that in most cases each test was given on a different day, so that the dangers of an "off day" might be lessened. To avoid the difficulties usually encountered when pupils of widely different degrees of maturity and of widely differing degrees of education are tested by the same materials, different tests were given to pupils of different grades, but those tests so overlap that comparison and correlation are possible throughout with known relations between the different tests.

The results of those tests are indicated in Tables 7 to 31, and those results are discussed in Chapter III. The median record on each test for each grade and for each significant age group were computed and the record of each pupil compared with those medians. Thus it was possible to determine the relative standing of each pupil in comparison with his fellow pupils by grade and age, or with pupils of other grades and of other ages. On those bases a careful study was made to ascertain what pupils were apparently children of marked inferiority or of marked superiority. All such pupils and all doubtful cases were selected for further examination by an exhaustive individual test of the type described below. Thus it will be seen that the group intelligence tests were employed in part as a means for selecting special cases requiring individual examination.

## II INDIVIDUAL INTELLIGENCE TESTS.

The group tests described above sufficed to indicate in general the capacities of pupils and to suggest a possible classification of pupils. For many reasons, however, it was considered desirable to supplement these group tests by individual tests, particularly for those pupils whose records on the group tests indicated marked inferiority or marked superiority, and for those pupils whose status was doubtful or who appeared misplaced in grade classification. Hence in December individual tests were given to a large number of pupils by members of the staff of investigation and that testing was continued by members of the Winchester teaching staff who had been trained for that work by the specialists.

For the individual tests the Stanford Revision of the Binet-Simon Intelligence Tests was employed. Those tests have been carefully standardized and are recognized throughout this country and Europe as affording a reliable measure of the mental capacity of children up to the age of about fifteen or sixteen. The results are given in terms of mental age—a mental age of six, for instance, meaning a mentality of the quality found in the average child six years of age. Thus, for example, if a child ten years of age is shown by these tests to have a mental age of ten he is considered to be a child of average or normal mentality. If he has a mental age of less than ten he must be considered to have a mentality below that of the average child,

the degree of his mentality being indicated by the amount to which his mental age falls below his chronological age. If he has a mental age of more than ten that child must be considered to have a mentality above that of the average child of his age, the superiority of his mentality being indicated by the amount to which his mental age exceeds his chronological age.

As a measure of the intelligence of any child the ratio between his mental age (as shown by this test) and his chronological age is employed. In order to secure a single figure for comparative purposes in considering children of varying mental and chronological ages the measure commonly employed is the "Intelligence Quotient" (commonly abbreviated thus—"I. Q.") which is found by dividing the child's mental age by his chronological age. Thus an Intelligence Quotient of 1.00 would indicate that the child is of average or normal mentality—that his intelligence is that of the average child of the same chronological age. Any "I. Q." below 1.00 would indicate the degree of inferiority shown by the actual "I. Q." in any given case, and any "I. Q." above 1.00 would indicate the degree of superiority shown by the actual "I. Q." in any given case.

The results of these individual tests were entered on the record card of each pupil examined and constitute the most important means for recommendations concerning the pupils. Those results are discussed in Chapter III.

### III. ACHIEVEMENT TESTS.

In addition to the psychological tests described in the preceding sections certain standard achievement tests were given. These included the following: (1) the Curtis Standard Arithmetic Tests (Grades 3-8); (2) the Monroe Silent Reading Test (Grades 3-8); (3) The Virginia Reading Test (Grades 1-3); (4) The Ayres Spelling Test (Grades 3-8); (5) The Holmes Handwriting Test (Grades 3-8).

These achievement tests were given not for the purpose of measuring the work of the school, but for the purpose of securing additional information concerning the specific capacities of children and to provide the necessary information for recommendations concerning the grade classification of pupils. It was the belief of the investigators that important changes must be made in the grading and classification of pupils before any valuable information could be gained concerning the efficiency of the school in teaching the various school studies. The investigators have recommended that at the close of each school year achievement tests be given, so that progress may be measured from year to year and the work of pupils be measured by objective tests rather than by teachers' examinations. For the purposes of this investigation, however, achievement tests were designed for two purposes (a) to supplement the psychological

tests in the determination of the pupils' capacities, and (b) to provide the necessary information for specific recommendations concerning grade classifications.

The results of the tests in arithmetic and reading are presented in Tables 11 to 18, and are considered in Chapter III.

#### IV. TEACHERS' JUDGMENTS.

The teachers of all pupils concerned in this investigation were asked to enter on a special blank their judgments of each pupil's (a) intelligence, (b) scholarship, and (c) industry. All such judgments were checked against the pupil's record on the intelligence tests and on the achievements tests. Wherever discrepancies were found or conflicts were manifest a searching examination was made to locate its cause and to determine the correct status of the pupil. In a few cases the teachers' judgments served to call attention to errors in the test records. In many cases the tests proved conclusively that the teachers' judgments were wrong. In all cases the teachers' judgments and the test records served as valuable checks for the detection of error.

After all the information had been secured by the means outlined above and tabulations were completed a careful study was made of the capacities and educational status of each pupil in the schools and his records entered on a specially prepared record sheet. For each pupil in the schools a separate record sheet was prepared all information concerning that child being entered thereon in such a way that his standing could be compared with the norms for the various grades of the school. Finally a definite recommendation was made for the grading and classification of each pupil. These record sheets and recommendations were placed in the hands of the superintendent of schools for his guidance in the reclassification of pupils.

## CHAPTER III.

### CONDITIONS DISCLOSED.

#### I. THE CHRONOLOGICAL AGE OF PUPILS.

One of the first things to attract the attention of the investigators was the obvious disparity of age in pupils of the same grades in the Winchester Schools. A careful examination showed that the situation was as indicated in Table 3, which shows that:

(1) There is a range of at least six years between the youngest pupil and the oldest pupil in any grade from the first to the eighth, in the second grade the range of ages being greatest—nine years.

(2) In each grade from the first to the eighth the median age is at least one year above the national standard for that grade.

(3) On the basis of a two-year span for each grade (e. g., six to seven for the first grade, seven to eight for the second grade, etc.) forty per cent of all pupils in grades one to eight are older than they should be for the grades in which they are located, the lowest percentage being 31% in grade four and the highest percentage being found in grade eight, 54%. In grades six and eight there are actually more pupils over-age than of normal age.

(4) In grades one to eight only a little more than one-half of the pupils are of normal age for the grades in which they are located.

(5) In the first grade are found pupils of ages all the way from six to twelve; in the second grade from seven to sixteen; in the sixth grade from nine and a half to eighteen.

(6) Pupils twelve years of age are found in every grade from the first to the eighth and in general pupils of any year-age from eight to sixteen are scattered over at least five grades of the schools.

Such conditions seriously limit at the start the effectiveness of education which can be provided in any grade. It is an utter impossibility for any teacher to provide effective instruction to pupils who vary so widely in age and maturity. Until these conditions are remedied effective education cannot be provided.

One remedy for such conditions is found in provisions by which children can be brought into school to begin their school education at the proper age. An investigation of the entering ages of children now in the first and second grades gave the figures presented in Table 4. All grades are considered in Table 5. Those figures show the following facts:

(1) Of the 231 cases considered 7 (or 3%) had entered when they were five years of age, 91 (or 39%) when they were in their sixth year, 75 (or 32%) when they were in their seventh year, 37 (or 16%) when they were in their eighth year, 8 (or 4%) when they were in

their ninth year, and 13 (or 6%) when they were over nine years of age. In all 58 (or 25%)—one-quarter of all pupils had entered school when more than seven years of age.

(2) Of pupils in all grades from the first to the eighth 179 (or 23.5%)—nearly one-quarter—had entered school when more than seven years of age.

(3) The median age of entrance for pupils now in any grade of the school was approximately seven.

As long as pupils enter school at almost any age and as long as the tendency is to enter school a year late (according to the national standard), education in the city schools of Winchester will be handicapped (a) by delayed education, (b) by very heterogeneous instructional groups, (c) by the limited education which can be provided before older pupils begin to leave school.

## II. CONDITIONS SHOWN BY GROUP PSYCHOLOGICAL TESTS.

In Tables 7 to 13 are presented figures showing the results of the group psychological tests described in Chapter II. From those tables and from figures derived therefrom and presented in Tables 19 to 29 the following facts are clear:

(1) Pupils now located in the same grade and class differ so greatly in the mental capacities measured by the group psychological tests that in the first grade, for example, pupils are found varying all the way from a score of 1 to a score of 42 on Test G-1, in the second grade all the way from 14 to 47, in the third grade from 15 to 47, and in the fourth grade from 17 to 56. Similar variability is evident from all the tables for the tests given. All grades are widely heterogeneous with respect to the mental capacities of their pupils. See especially Table 19.

(2) Pupils receiving the same scores on the various group psychological tests are found scattered through four or five (perhaps more) grades of the schools. E. g., pupils receiving scores of 31 to 35 on Test G-3 are distributed as follows: 10 in grade one, 11 in grade two, 32 in grade three, and 28 in grade four, though such scores are approximately at the median score for grade four. Likewise pupils receiving scores of 51 to 55 on Test G-5 are distributed as follows: 7 in grade four, 12 in grade five, 16 in grade six, 18 in grade seven, and 5 in grade eight, though such scores are approximately the median for grade six.

(3) In any grade, as measured by any of the group psychological tests, pupils are found with scores at or below the median for pupils in a grade one, two, three, even four, grades below the grade in which they are located. Thus, for Test G-1, 68 pupils are found in grade four (74% per cent of the fourth grade pupils) whose scores are at or below the median score for pupils in grade three. Thus also for Test G-5, 18 pupils of grade eight (38% of all pupils in grade

eight) have scores at or below the median score for pupils in grade seven, 10 (21% of all) have scores at or below the median score for pupils in grade six, 2 (4% of all) have scores at or below the median score for pupils in grade five, and one pupil has a score below the median score for pupils in grade four.

(4) In any grade, as measured by any of the group psychological tests pupils are found with scores at or above the median score for pupils in a grade one, two, three, even four, grades above the grade in which they are located. Thus, for Test G-3, 28 pupils (25% of all pupils in the grade) are found in grade one whose scores are at or above the median score for pupils in grade two, 12 (12% of all) whose scores are at or above the median score for grade three, and 5 pupils (5% of all) whose scores are at or above the median score for pupils in grade four. Thus also, for Test G-5, 32 pupils (36% of all in the grade) are found in grade four whose scores are at or above the median score for pupils in grade five, five pupils (6% of all) whose scores are at or above the median score of pupils in grade six, 2 pupils (2% of all) whose scores are at or above the median score for grade seven, and one pupil whose score is above the median score of pupils in the eighth grade.

(5) For any of the psychological tests employed the percentage of pupils whose scores fall within the limits set by the median score for the grade below and the median score for the grade above any given grade ranges from 42.6 per cent for Test G-6 to 75.0 per cent for Test G-4. This means that for any of the tests from more than one-half to about one-quarter of the scores in any case fall below the median of the grade below or rise above the median of the grade above. See Table 29 especially.

The meaning of these facts is obvious. The results of the group psychological tests show clearly that the classification of pupils by grades in the schools of Winchester has far too little relation to the mental capacities to permit effective instruction. The great overlapping of capacities found is shown diagrammatically in Figures 1-7. The importance of special school training in this connection is considered below.

The results of the group psychological tests also show that pupils of widely differing capacities are grouped for instruction in the same grade and in the same class section. Pupils whose mental capacities differ so widely that some pupils can secure a score of forty or fifty points while some of their class fellows can secure a score of less than ten on the same tests cannot be instructed in the same class without great damage to both.

### III. CONDITIONS SHOWN BY THE INDIVIDUAL PSYCHOLOGICAL TESTS

In general the conditions shown by the group psychological tests are substantiated by the more searching and more reliable individual

psychological tests. The extremes of differences found are indicated in Table 6 which shows the wide differences between the least capable and the most capable pupils in each grade—the range in no case being less than three years in mental age and running as high as five years, or, perhaps, even as high as seven years, in mental age. The table of Intelligence Quotients in Table 6 also shows the great range of intelligence among pupils of the same grade, and frequently of the same instructional class.

Since individual psychological tests were given in the beginning to those pupils only whose cases appeared to indicate marked inferiority or superiority, and to those whose cases appeared doubtful or critical, no complete tabulation of results for all pupils is possible here. Plans for the completion of the individual testing involved gradual testing of pupils throughout the school year rather than at one time and certain of the Winchester teachers were trained for that purpose.

From the individual psychological tests already completed the following facts have been derived and deserve attention:

(1) In almost every grade, probably in every grade, pupils whose mental test shows an intelligence bordering on, if not actually of, feeble-mindedness, pupils of normal intelligence, and pupils of superior intelligence are being educated, or rather the attempt is being made to educate them, in the same classes. Thus in grade one are found, among others, two pupils with an "I. Q." of below .60, four pupils with an "I. Q." between .61 and .70, five pupils with an "I. Q." between .71 and .80, nine pupils with an "I. Q." between .81 and .90, ten pupils with an "I. Q." between .91 and 1.00, three pupils with an "I. Q." between 1.01 and 1.10, five pupils with an "I. Q." between 1.11 and 1.20, and one pupil with an "I. Q." of 1.21.

(2) In grade one there are at least six children whose mentalities are those of the feeble-minded or moron, \*in the second grade there are at least nine, in the third grade there are at least two, in the fourth grade no case was discovered, in the fifth grade there are at least two, in the sixth grade there are at least three, and in the seventh grade there is at least one. These should all be placed either in a special institution, or in special classes for their own sakes.

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\*Note: These statements concerning feeble-mindedness are, of course, based solely on the individual psychological tests. There is a small proportion of children who may pass the tests and on other grounds, chiefly of a clinical nature, be judged feeble-minded. Similarly there is a small proportion of children who may fail to pass the tests but on other grounds cannot be considered feeble-minded. When, however, these results are supported by retardation in school and failure in school accomplishments, the school authorities cannot do otherwise, in the absence of medical opinion to the contrary, than diagnose them as special class cases.



(3) In the first grade (taking that grade for an example of diversity) there are at least seventeen pupils with a mental age of less than seven and at least eight pupils with a mental age of more than eight. Such diverse mentalities cannot be taught together effectively.

#### IV. CONDITIONS SHOWN BY TESTS IN READING AND ARITHMETIC

Obviously the grade classification of pupils cannot be determined solely by the general intelligence of pupils, and, therefore, the results of the psychological tests above considered cannot tell the whole story. The information gained from the psychological tests must be considered in its relation to certain specific abilities involved in school studies. The most important of these are reading and arithmetic.

What are the conditions shown by tests in Reading and Arithmetic in the Winchester Schools?

(a) *Reading:* In Tables 14-15 are presented figures showing the results of the Monroe Tests for Comprehension and Rate (Amount) of Reading. In Table 27 also certain figures derived from the basal tables are presented. Those figures show the following important facts:

(1) Table 15 shows that for comprehension in reading pupils in each grade from the third to the eighth vary widely, the range from the lowest pupil to the highest pupil being from zero to fourteen in the third grade, from zero to twenty-seven in the fourth grade, from two to twenty-seven in the fifth grade, from four to thirty-nine in the sixth grade, from two to forty-six in the seventh grade, and from eight to forty-two in the eighth grade. See especially Table 19.

(2) Table 15 also shows that for comprehension in reading pupils of approximately the same degree of ability are scattered over many grades, sometimes all the way from the lowest grade to the highest. Thus, pupils having scores between 11 and 15 are distributed as follows: 4 in the third grade, 30 in the fourth grade, 35 in the fifth grade, 24 in the sixth grade, 9 in the seventh grade, and 8 in the eighth grade—though such scores are approximately the median scores for the fourth and fifth grades.

(3) Table 27 shows that in any grade from the third to the eighth pupils are found with comprehension ability in reading at or below the median for pupils in a grade one, two, three, four, or five grades below the grade in which they are located. Thus of pupils in the eighth grade 1 pupil is at or below the median for the fourth grade, 3 at or below the median for the fifth grade, twelve (25%) below the median for the sixth grade, and thirty-three (75%) at or below the median for the seventh grade.

(4) Table 27 also shows that any grade from the third to the eighth pupils are found with comprehension ability in reading at or above the median for pupils in a grade one, two, three, four, or five grades above the grade in which they are located. Thus of pupils in the fourth grade thirty-one are at or above the median for pupils in the fifth grade, nine at or above the median for pupils in the sixth grade, one at or above the median for pupils in the seventh grade, and two at or above the median for pupils in the eighth grade.

(5) Table 29 shows that the proportion of pupils whose comprehension ability in reading falls within the limits set by the median for the grade below and that set for the grade above is 57.3 per cent. This means that over two-fifths of all pupils fall below the median of the grade below or rise above the median of the grade above that in which they are located.

(6) Table 14 shows that for the amount read within the time limits of the test pupils in each grade from the third to the eighth vary widely, the range from the lowest to the highest pupil being from 0 to 87 in the third grade, from 0 to 127 in the fourth grade, from 15 to 141 in the fifth grade, from 54 to 146 in the sixth grade, from 54 to 146 in the seventh grade, and from 31 to 146 in the eighth grade. See especially Table 19.

(7) Table 14 also shows for the amount read pupils of approximately the same ability in reading are scattered all the way from the lowest to the highest grades in some cases. Thus pupils having scores between 81 and 90 are distributed as follows: 1 in the third grade, 16 in the fourth grade, 12 in the fifth grade, 25 in the sixth grade, 11 in the seventh grade, and 9 in the eighth grade—though such scores fall between the medians of the fifth and sixth grades.

(8) Table 27 shows that in any grade from the third to the eighth pupils are found with amount-of-reading abilities at or below the median for pupils in grade one, two, three, four, or five grades below the grade in which they are located. Thus, of pupils in the eighth grade thirty-eight (81%) have scores at or below the median of the seventh grade, twenty-seven (58%) have scores at or below the median for the sixth grade, seven (15%) have scores at or below the median for the fifth grade, two have scores at or below the median for the fourth grade, and one has a score at or below the median for the third grade.

(9) Table 27 also shows that in any grade from the third to the eighth pupils are found with amount-of-reading abilities at or above the median for a grade one, two, three, four, or five grades above the grade in which they are located. Thus of pupils in the fourth grade thirty-seven (42%) have scores at or above the median of the fifth grade, seventeen (19%) have scores at or above the median for the sixth grade, two have scores at or above the median for the seventh

grade, and seventeen (19%) have scores at or above the median for the eighth grade.

(10) Table 29 shows that the proportion of all pupils whose amount-of-reading abilities fall within the limits set by the median of the grade below and that of the grade above is 16.7 per cent. This means that more than one-half of all pupils have amount-of-reading abilities which either fall below the median of the grade below or rise above the median of the grade above that in which they are located.

(b) *Arithmetic:* In Tables 16-18 are presented figures showing the results of the Courtis Standard Tests in Arithmetic and certain derived figures are presented in Table 28. Those figures show the following facts—

(1) Tables 16-17 show that in any one grade are found pupils whose arithmetical abilities vary widely, the range between the poorest pupil and the best pupil for addition being from 0 to 6 in the third and fourth grades, from 0 to 8 in the fifth grade, from 0 to 11 in the sixth grade, from 0 to 8 in the seventh grade, and from 0 to 12 in the eighth grade. For other processes the range is even greater, especially in the upper elementary grades after subtraction, multiplication, and division have been introduced. E. g., the range of abilities in division in the seventh grade is from 0 to 18. See especially Table 19.

(2) Tables 16-17 also show that pupils of the same degree of arithmetical abilities in addition, subtraction, multiplication, and division are scattered all the way from the third grade to the eighth grade. Thus pupils having a score of zero are found in every grade from the third to the eighth, except for the eighth grade in subtraction and multiplication. Thus also of 41 pupils having a score of 5 in multiplication four are found in the fourth grade, 2 in the fifth grade, 13 in the sixth grade, 15 in the seventh grade, and 7 in the eighth grade.

(3) Table 28 shows that in many grades pupils are found with arithmetical abilities at or below the median for a grade one, two, three, four, or five grades below the grade in which they are located. Thus for addition of 49 pupils in the eighth grade twenty-three (47%) have scores at or below the median for the seventh grade, twenty-three (47%) have scores at or below the median for the sixth grade, eleven (22%) have scores at or below the median for the fifth grade, five (10%) have scores at or below the median for the fourth grade, and two have scores at or below the median for the third grade. Much the same is true of other processes.

(4) Table 28 also shows that in many grades pupils are found with arithmetical abilities at or above the median for a grade, one, two, three, four, or five grades above the grade in which they are

located. Thus for addition of 88 pupils in the fourth grade 24 (27%) have scores at or above the median for grade five, ten (12%) have scores at or above the median for grade six, four have scores at or above the median for grade seven, and three have scores at or above the median for grade eight. Much the same is true for other processes, except as the amounts of superiority are affected by later introduction of multiplication and division.

(5) Table 29 shows that the proportions of pupils whose arithmetical abilities fall within the limits set by the median of the grade below and that of the grade above are: for addition 47.2 per cent; for subtraction 57.9 per cent; for multiplication 56.4 per cent; for division 45.3 per cent; for aggregate scores in arithmetic 64.8 per cent.

The facts disclosed by the tests in reading and arithmetic indicate clearly that education in the schools of Winchester is not well adapted to the varying capacities of the children in various grades of the schools. The attempt is made to teach in the same classes advanced forms of reading to pupils whose present reading abilities range all the way from near-illiteracy to the reading abilities of the average high-school senior. It cannot be done. Likewise the attempt is being made to teach in the same classes the more complex forms of arithmetic to pupils in the upper grades whose abilities in the fundamental operations vary all the way from nearly zero to the abilities of the skilled accountant or bookkeeper. Again it cannot be done.

Both psychological tests and subject tests show clearly that there is great need in the schools of Winchester for reform in the grade classification of pupils, in the formation of classes for instruction, and in the adaptation of instruction to the capacities and needs of the various groups of pupils. They also furnish the needed information for the accomplishment of these purposes.

#### V. THE RELIABILITY OF TEACHERS' JUDGMENTS.

Teachers' judgments in general indicated the same wide variability in the capacities and achievements of pupils in the same classes as was indicated by the psychological tests and by the achievement tests given in this investigation. Nevertheless two facts are clear: (a) that teachers themselves differ in their ability to estimate the capacities and achievements of the pupils under their instruction, and (b) that in a large proportion of cases teachers' judgments cannot be relied upon. This is shown clearly from the figures presented in Tables 30 and 31.

In Table 30 are presented figures showing divisions of the classes (by fifths) into which fall the scores received by pupils who were judged by their teachers to be of average intelligence—graded C by the teachers. In all forty-five pupils were so graded by the teachers. Of these 12 received scores on Test G-1 indicating a position in the

lowest fifth of their class, 9 received scores placing them in the next to the lowest fifth of the class, 8 received scores placing them in the middle fifth of the class, 9 received scores placing them in the next to the highest fifth of the class, and 7 received scores placing them in the highest fifth of the class. Much the same situation is indicated by the scores for Test G-2.

Even more significant are the figures presented in Table 31. In that table are compared the ratings given by teachers and the Intelligence Quotients of 130 pupils. A lack of close correlation is evident. Thus 11 pupils were shown by the Stanford-Binet Intelligence Tests to have an Intelligence Quotient between .94 and .95, probably indicating feeble-mindedness or a moron status. Three of those pupils were rated in the lowest part of their classes by the teachers' rating for intelligence, three were rated in the next to the lowest fifth, three in the middle fifth, one in the next to the highest fifth, and one in the highest intelligence group. Likewise, of 17 pupils whose intelligence tests showed approximately normal intelligence (I. Q. between .96 and 1.05) one was rated by the teachers as belonging in the lowest fifth of the pupils, four were rated as belonging in the next to the lowest fifth, three were rated as belonging in the middle fifth, six as belonging in the next to the highest fifth, and three were rated as belonging in the highest fifth. Likewise, also, of two pupils whose superior intelligence was indicated by Intelligence Quotients between 1.26 and 1.30 one was rated by the teacher as belonging in the lowest fifth, while the other was rated as belonging in the highest fifth. Finally the pupil receiving the highest rating for intelligence by the test was placed in the next to the highest fifth only—that child with an I. Q. of 1.51 being placed by the teacher in the same group with a pupil having an I. Q. of .59.

This unreliability of the teacher's judgment may further be illustrated by the ratings given by Teacher X who assigned a grade of A to one pupil having an I. Q. of .96, a grade of D to another with the same I. Q., a grade of E to another pupil having an I. Q. of .97, a grade of C to another pupil having an I. Q. of .98—all four of those pupils having almost exactly the same intelligence. Likewise, Teacher Y assigned a grade of B to one pupil having an I. Q. of 1.12, to another having an I. Q. of .89, to another having an I. Q. of .65, and to another having an I. Q. of .59.

The importance of these facts is emphasized by the fact that it is particularly in critical cases that the teacher's judgment is most likely to be unreliable, e. g., in the case of an over-age pupil in a grade where his intelligence unconsciously is compared with the average intelligence of younger children, or in the case of an under-age pupil whose intelligence is unconsciously estimated in comparison with the average intelligence of older pupils. In all critical cases the teacher's judgment should be checked up by objective standards established by group and individual tests.

## CHAPTER IV.

### CONCLUSION AND RECOMMENDATIONS.

The conditions disclosed by the various psychological and educational tests given show that effective instruction is seriously handicapped, if not rendered impossible, in the public schools of Winchester because of defects in the classification of pupils in grades and classes, because of failure to recognize individual differences among pupils in the same grade or class, and because those two defects prevent the proper adaptation of instruction to pupils of varying capacities and needs. It remains to make recommendations for changes which will remedy existing defects and render effective education possible.

General recommendations are as follows:

(1) Provision should be made for the entrance of children into school more nearly at a standard age of six. Circumstances over which the school authorities have little control may prevent absolute uniformity in this but parents and school authorities should recognize that original diversity in maturity among pupils in the first grade must handicap the work of the schools at all stages. It should be possible to avoid the extremes now found as indicated in Tables 3-6. As long as the present conditions in this respect continue there is little possibility of securing in grades and classes pupils of reasonably homogenous capacities, maturity and needs. Reform in this direction need not await a State law for compulsory attendance.

(2) Special classes should be organized for pupils whose intelligence is markedly sub-normal. In all probability it is possible to organize at once at least two such special classes—one for younger pupils now found in the lower grades (grades one to three or four) and one such class for older pupils now in grades four or five to six or seven. Older sub-normal pupils should be provided for in the Junior High School where flexibility in class selection is simpler. On this see Recommendation (4) below.

(3) Wherever the number of pupils in any grade is large enough (and this is true for all grades in the Elementary School) pupils should be divided into class sections so that there is at least one class for pupils of normal mentality, one class for those who are of mentality below normal but not seriously defective, and one class for pupils of superior mentality.

(4) Provision should be made for a more flexible system of promotion and grade classification. In particular provision should be

made for the removal of excessively over age pupils now found in the lower grades to some form of work in the Junior High School. It is necessarily a choice of evils, but it is better to place backward pupils of older age in some courses in the Junior High School than to retain them in lower grades where their work must be more or less limited to abstract book work of which they are incapable. Needless to say this cannot be done unless appropriate practical arts work is provided for them in the Junior High School.

(5) Psychological and educational tests should be given to every child entering the school hereafter and all doubtful cases should be reexamined from time to time. With few exceptions, every pupil now in the Elementary or Junior High School has been tested. Continuous testing of entrants hereafter should be a relatively simple task.

(6) Annually at the close of each school year standard educational tests in reading, arithmetic, spelling, handwriting, and such other school studies for which adequate objective tests exist, should be given, so that an annual accounting may be made of the work of the schools. If the proper reorganization of grade and class assignments is made, such standard tests should provide an accurate measure of the work of the schools objectively judged.

(7) When the proper re-classification of pupils by grades and classes is made and when the special classes, slow moving classes, classes of normal progress, and classes of rapid progress have been established, there is great need of a careful adjustment of instruction to the needs and capacities of each of those classes. Provision for reorganization to meet the demands of the recommendations given above will be relatively useless unless real changes are made in the instruction provided and proper adaptation is made of instruction to the needs of the different classes organized.

(8) Provision should be made on the staff for one or more persons skilled in the application of psychological and educational tests. A beginning of this was made through the training of several teachers and school officers in this investigation.

The school authorities of the City of Winchester have a unique opportunity to demonstrate in a thoroughgoing fashion the possibilities of a real adaptation of instruction to the needs and capacities of children. There can be no doubt that the practice now found throughout the country is socially and educationally vicious. As long as it continues there can be but one result: the neglect of all that majority of pupils whose capacities and needs do not receive attention in the public schools and whose interests are sacrificed to the advantages of that relatively small proportion of children who may look forward to continued education in High School and College.

# APPENDIX.

TABLE 3.

Showing the distribution by age and grade of pupils in Winchester Elementary Schools, as of Sept. 1, 1919.

Approximate age in years	Covering ages in months and years		Grades							Totals	
	From	To	1	2	3	4	5	6	7	8	
6.0	5-10	6-3	18	—	—	—	—	—	—	—	18
6.5	6-4	6-9	25	—	—	—	—	—	—	—	25
7.0	6-10	7-3	27	8	—	1	—	—	—	—	36
7.5	7-1	7-9	14	14	4	—	—	—	—	—	32
8.0	7-10	8-3	20	23	20	2	—	—	—	—	65
8.5	8-4	8-9	9	16	22	2	2	—	—	—	51
9.0	8-10	9-3	9	9	17	17	2	—	—	—	54
9.5	9-4	9-9	2	9	15	13	3	1	—	—	43
10.0	9-10	10-3	—	5	10	13	7	—	—	—	35
10.5	10-4	10-9	3	6	6	20	14	5	1	—	55
11.0	10-10	11-3	—	8	10	9	19	9	1	1	57
11.5	11-4	11-9	—	3	5	7	13	11	3	—	42
12.0	11-10	12-3	1	3	4	4	14	9	7	1	43
12.5	12-4	12-9	—	3	5	4	9	11	17	—	49
13.0	12-10	13-3	—	2	3	4	11	6	18	2	46
13.5	13-4	13-9	—	1	1	1	7	9	13	9	41
14.0	13-10	14-3	—	1	—	1	3	11	8	6	30
14.5	14-4	14-9	—	—	—	—	2	6	4	4	16
15.0	14-10	15-3	—	—	—	1	—	6	11	5	23
15.5	15-4	15-9	—	—	1	—	4	2	4	8	19
16.0	15-10	16-3	—	1	—	—	1	2	3	8	15
16.5	16-4	16-9	—	—	—	—	—	—	2	2	4
17.0	16-10	17-3	—	—	—	—	—	—	2	3	5
17.5	17-4	17-9	—	—	—	—	—	—	1	1	2
18.0	17-10	18-3	—	—	—	—	—	1	—	—	1
Totals			128	112	123	99	111	89	95	50	807

Medians	7 yrs.	8 yrs.	9 yrs.	10 yrs.	11 yrs.	12 yrs.	13 yrs.	14 yrs.	—
	2 mos.	7 mos.	3 mos.	4 mos.	7 mos.	9 mos.	4 mos.	10 mos.	
Range in years	6.0	7.0	7.5	7.0	8.5	9.5	10.5	11.0	6.0
	to 12.0	to 16.0	to 15.5	to 15.0	to 16.0	to 18.0	to 17.5	to 17.5	to 18.0
Per cent over-age <sup>1</sup>	44	51	45	31	51	43	35	27	327
Number under age	0	0	4	5	7	6	5	2	29
Number of normal age	84	61	74	63	53	40	55	21	451
Number over-age <sup>1</sup>	34	46	37	31	46	48	37	54	40
Per cent under age	0	0	3	5	6	7	5	4	4
Per cent of normal age	66	54	60	63	48	45	58	42	56

Note 1: In this table normal age is estimated on the basis of a two-year span, i. e., 6-7 for normal age is in the first grade, etc. The over-age would, of course, be much greater on the basis of a one-year span.



TABLE 4.

Showing the number of pupils now in grades one and two who entered school at different ages—Winchester City.

Ages		Grade	Grade	Total in
From	To	1	2	Grades 1-2
5 yrs. 4 mos.	5 yrs. 5 mos.	—	1	1
5 yrs. 6 mos.	5 yrs. 11 mos.	1	5	6
6 yrs. 0 mos.	6 yrs. 5 mos.	32	16	48
6 yrs. 6 mos.	6 yrs. 11 mos.	32	11	43
7 yrs. 0 mos.	7 yrs. 5 mos.	23	27	50
7 yrs. 6 mos.	7 yrs. 11 mos.	12	13	25
8 yrs. 0 mos.	8 yrs. 5 mos.	12	5	17
8 yrs. 6 mos.	8 yrs. 11 mos.	7	13	20
9 yrs. 0 mos.	9 yrs. 5 mos.	3	2	5
9 yrs. 6 mos.	9 yrs. 11 mos.	1	2	3
10 yrs. 0 mos.	10 yrs. 5 mos.	—	5	5
10 yrs. 6 mos.	10 yrs. 11 mos.	—	1	1
11 yrs. 0 mos.	11 yrs. 5 mos.	1	4	5
11 yrs. 6 mos.	11 yrs. 11 mos.	—	1	1
12 yrs. 0 mos.	12 yrs. 5 mos.	—	—	—
12 yrs. 6 mos.	12 yrs. 11 mos.	—	—	—
13 yrs. 0 mos.	13 yrs. 5 mos.	—	—	—
13 yrs. 6 mos.	13 yrs. 11 mos.	1	—	1
Total number of cases		125	106	231
Median ages		6 yrs. 11 mos.	7 yrs. 2 mos.	7 yrs. 6.5 mos.
Number of pupils entering at age of 8 years or above		25	33	58
Per cent entering at age of 8 or above		20%	32%	25%

TABLE 5.

Showing the entrance-age distribution of pupils in the Winchester Schools, grades one to eight.

Entrance Age	Grade	Grade	Grade	Grade	Grade	Grade	Grade	Grade	Totals	
	1	2	3	4	5	6	7	8	No.	%
5	1	6	9	20	14	13	7	6	76	10.0
6	61	27	13	32	44	25	30	8	273	35.7
7	35	10	33	29	22	31	30	17	237	30.8
8	19	18	22	10	12	15	17	10	123	16.1
9	4	4	5	4	7	2	1	3	30	3.9
10	—	6	1	—	2	1	4	—	14	2.0
11	1	5	1	—	2	—	2	—	11	1.4
12	—	—	—	—	—	—	—	—	—	—
13	1	—	—	—	—	—	—	—	1	0.1
Totals	125	106	114	95	103	87	91	44	765	100.0
Median age	6 yrs. 11 mos.	7 yrs. 2 mos.	7 yrs. 0 mos.	6 yrs. 11 mos.	6 yrs. 10 mos.	7 yrs. 2 mos.	7 yrs. 1 mo.	7 yrs. 5 mos.	6 yrs. 11 mos.	
Number entering at 8 or above	25	33	29	14	23	18	24	13	179	23.5
Per cent entering at 8 or above	20.0	31.1	25.4	14.7	22.3	20.7	26.4	29.6	23.5	—

TABLE 6.

Showing for grades one to eight of the Winchester Public Schools the extremes (a) of chronological age, (b) of mental age, and (c) of intelligence quotient.

Grade	Chronological age			Mental age			Intelligence Quotient		
	Lowest	Highest	Range	Lowest	Highest	Range	Lowest	Highest	Range
1	5-11	12-3	7-4	5-2	8-11	3-9	.50	1.20	.70
2	6-10	16-0	9-2	6-8	9-9	3-1	.43	1.20	.77
3	7-4	14-0	6-6	8-4	11-4	3-0	.69	1.25	.56
4	8-0	14-0	6-0	9-2	12-4	3-2	.80	1.35	.55
5	8-8	16-0	7-4	8-5	13-9	5-4	.51	1.48	.97
6	9-8	18-2	8-6	9-5	13-4	3-11	.62	1.19	.57
7	11-5	17-6	6-1	9-8	14-8	5-0	.58	1.23	.65
8	10-11	17-8	6-9	10-2	(17-3)	7-1	.54	1.51	.97

Note:—Figures in years and months for chronological age and mental age, e. g. 5-11 means five years and eleven months.

TABLE 7.

Showing the distribution of scores in Test G-1 in grades one to four of the Winchester Schools.

Scores	Grade 1	Grade 2	Grade 3	Grade 4
1-5	9			
6-10	19			
11-15	27	4	4	
16-20	21	7		1
21-25	18	16	7	2
26-30	7	19	29	9
31-35	4	34	39	15
36-40	3	11	27	2
41-45	4	9	11	12
46-50		4	3	10
51-55				2
56-60				4
Total number of cases	112	194	117	92
Medians	16.3	31.7	31.6	38.0

TABLE 8.

Showing the distribution of scores in Test G-2 in grades one to four of the Winchester Schools.

Scores	Grade 1	Grade 2	Grade 3	Grade 4
1-5	14			
6-10	36	5	4	
11-15	33	28	11	1
16-20	16	35	32	15
21-25	8	22	47	
26-30	2	4	22	14
31-35			5	2
Total number of cases	109	94	117	94
Medians	11.7	17.5	21.4	26.0

TABLE 9.

Showing the distribution of scores in Test G-3 in grades one to four of the Winchester Schools.

Scores	Grade 1	Grade 2	Grade 3	Grade 4
1-5	9	7	1	2
6-10	28	8	4	—
11-15	7	15	10	4
16-20	36	17	5	3
21-25	15	20	16	8
26-30	4	15	24	14
31-35	10	14	32	28
36-40	2	4	22	27
41-45	—	—	3	7
46-50	—	—	—	1
Total number of cases	111	100	117	94
Medians	17.7	21.7	30.5	34.1

TABLE 10.

Showing the distribution of scores in Test G-4 in grades three to six of the Winchester schools.

Scores	Grade 3	Grade 4	Grade 5	Grade 6
21-25	5	—	—	—
26-30	10	—	—	—
31-35	13	2	1	—
36-40	17	5	—	—
41-45	20	6	3	—
46-50	17	6	3	—
51-55	11	9	7	1
56-60	8	17	10	4
61-65	2	12	11	5
66-70	4	14	14	8
71-75	1	8	22	11
76-80	2	9	15	13
81-85	—	1	6	16
86-90	—	2	4	9
91-95	—	1	2	7
96-100	—	—	—	8
101-105	—	—	—	4
106-110	—	—	1	—
Total number of cases	110	92	99	86
Medians	43	60	70	81

TABLE 11.

Showing the distribution of scores in Test G-5 in grades seven to eight of the Winchester schools.

Scores	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11
16-20	2	3	-	-	-
21-25	5	6	-	-	-
26-30	11	6	1	-	1
31-35	11	10	-	2	-
36-40	18	11	5	2	-
41-45	11	17	10	5	1
46-50	15	18	12	8	1
51-55	7	12	16	18	5
56-60	3	9	11	11	6
61-65	1	5	11	8	2
66-70	1	1	6	15	19
71-75	-	1	5	10	8
76-80	-	-	1	9	2
81-85	-	-	1	4	-
86-90	-	-	1	-	-
Total number of cases	88	99	85	90	47
Medians	39	43	55	61	67

TABLE 12.

Showing the distribution of scores in Test G-6 in grades six to eight of the Winchester Schools.

Scores	Grade 6	Grade 7	Grade 8
16-20	-	1	-
21-25	1	1	2
26-30	14	4	-
31-35	27	16	8
36-40	14	21	15
41-45	17	28	14
46-50	7	15	6
51-55	2	2	1
Number of cases	82	90	46
Medians	45.8	41.0	39.6

TABLE 13.

Showing the distribution of scores in Test G-7 in grades six to eight of the Winchester Schools.

Scores	Grade 6	Grade 7	Grade 8
11-20	—	2	—
21-30	5	2	—
31-40	11	1	2
41-50	27	8	3
51-60	14	17	11
61-70	14	21	13
71-80	5	19	10
81-90	7	9	5
91-100	—	5	2
101-110	—	3	2
111-120	—	3	—
121-130	—	1	—
Total number of cases	83	91	48
Medians	50	68	67

TABLE 14.

Showing the distribution of scores for amounts read in the Monroe Reading Tests in grades three to eight of the Winchester Schools.

Scores	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
0	12	1	—	—	—	—
1-10	3	—	—	—	—	—
11-20	5	1	1	—	—	—
21-30	23	1	—	—	—	—
31-40	22	4	3	—	—	1
41-50	16	7	8	—	—	—
51-60	21	22	15	6	5	1
61-70	7	14	15	6	2	5
71-80	4	5	15	—	—	1
81-90	1	16	12	25	11	9
91-100	—	10	13	17	13	10
101-110	—	2	5	9	12	7
111-120	—	3	4	6	13	4
121-130	—	2	1	—	—	—
131-140	—	—	—	6	7	5
141-150	—	—	4	9	26	4
No. of cases	114	88	96	84	89	47
Medians	31	67	76	98	119	98

TABLE 15.

Showing the distribution of scores for comprehension in the Standard Reading Test in grades three to eight of the Winchester Schools.

Scores	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
0-0.9	30	1	-	-	-	-
1-5	58	15	6	1	-	-
6-10	22	30	22	6	2	-
11-15	4	30	35	24	9	8
16-20	-	10	25	29	15	14
21-25	-	1	7	12	7	10
26-30	-	1	1	6	10	9
31-35	-	-	-	4	16	2
36-40	-	-	-	2	15	2
41-45	-	-	-	-	2	1
46-50	-	-	-	-	2	-
No. of cases	114	88	96	84	89	47
Medians	3.2	10.4	13.0	18.0	25.1	21.1

TABLE 16.

Showing the distribution of scores in addition and subtraction  
(Rights) Curtis Arithmetic Tests in Winchester Schools, grades 3-8.

## ADDITION

## SUBTRACTION

Grade	Grade	Grade	Grade	Grade	Grade	Scores	Grade	Grade	Grade	Grade	Grade	Grade
3	4	5	6	7	8		3	4	5	6	7	8
78	30	22	13	9	2	0	107	48	26	8	7	-
18	23	12	10	6	3	1	4	10	22	7	6	1
12	11	24	10	8	6	2	1	12	16	10	8	2
3	14	19	9	15	8	3	-	7	13	13	7	1
1	6	7	19	9	4	4	2	6	9	11	7	3
1	1	7	9	18	6	5	-	2	3	8	12	6
1	3	-	7	13	7	6	-	3	3	11	12	1
-	-	3	4	10	4	7	-	-	2	3	4	6
-	-	1	1	3	6	8	-	-	-	2	6	7
-	-	-	-	-	1	9	-	-	1	5	6	6
-	-	-	-	-	1	10	-	-	-	3	10	6
-	-	-	1	-	-	11	-	-	-	-	2	4
-	-	-	-	-	1	12	-	-	-	-	2	2
-	-	-	-	-	-	13	-	-	-	1	-	2
-	-	-	-	-	-	14	-	-	-	-	1	1
-	-	-	-	-	-	15	-	-	-	-	1	1
-	-	-	-	-	-	16	-	-	-	-	-	-
-	-	-	-	-	-	17	-	-	-	-	-	-
-	-	-	-	-	-	18	-	-	-	-	-	-
-	-	-	-	-	-	19	-	-	-	-	-	-
-	-	-	-	-	-	20	-	-	-	1	-	-
114	88	95	83	91	49	Totals	114	88	95	83	91	49
0.7	1.6	2.6	4.0	4.4	5.3	Medians	0.5	0.9	2.0	4.4	5.7	8.7



TABLE 17.

Showing the distribution of scores in Multiplication and division  
(Rights) Courtis Arithmetic Tests in Winchester Schools, grades 3-8.

## MULTIPLICATION

## DIVISION

Grade	Grade	Grade	Grade	Grade	Grade	Scores	Grade	Grade	Grade	Grade	Grade	Grade
3	4	5	6	7	8		3	4	5	6	7	8
111	50	29	7	3	—	0	114	76	56	16	6	2
3	23	25	14	3	1	1	—	7	21	6	4	1
—	7	15	8	7	2	2	—	5	9	9	5	2
—	2	15	12	3	1	3	—	—	8	9	8	4
—	2	8	10	9	7	4	—	—	—	12	11	4
—	4	2	13	15	7	5	—	—	—	7	6	1
—	—	—	9	14	8	6	—	—	1	7	4	5
—	—	1	4	14	4	7	—	—	—	6	5	7
—	—	—	3	10	6	8	—	—	—	5	12	6
—	—	—	1	7	6	9	—	—	—	3	—	2
—	—	—	—	4	4	10	—	—	—	2	6	4
—	—	—	2	—	3	11	—	—	—	1	5	—
—	—	—	—	2	—	12	—	—	—	—	5	5
—	—	—	—	—	—	13	—	—	—	—	4	3
—	—	—	—	—	—	14	—	—	—	—	2	—
—	—	—	—	—	—	15	—	—	—	—	1	—
—	—	—	—	—	—	16	—	—	—	—	1	1
—	—	—	—	—	—	17	—	—	—	—	—	—
—	—	—	—	—	—	18	—	—	—	—	1	—
114	88	95	83	91	49	Totals	114	88	95	83	91	49
0.5	0.9	1.8	4.0	6.4	6.9	Medians	0.0	0.6	0.9	4.2	7.0	7.7

TABLE 18.

Showing the distribution of scores for aggregates (addition, subtraction, multiplication, and division) in Courtis Arithmetic Tests (Rights) in Winchester Schools, grades 3-8.

Scores	Grade	Grade	Grade	Grade	Grade	Grade
	3	4	5	6	7	8
0	75	10	8	1	—	—
1	18	16	9	—	—	—
2	12	10	5	2	2	—
3	4	15	5	1	1	1
4	3	7	11	1	—	—
5	—	8	8	3	1	—

Scores	Grade	Grade	Grade	Grade	Grade	Grade
6	—	4	11	3	1	—
7	1	4	5	—	—	—
8	—	4	4	2	1	—
9	—	1	6	3	2	—
10	1	2	2	4	2	3
11	—	—	6	5	4	—
12	—	3	4	4	2	—
13	—	—	2	4	5	—
14	—	—	3	3	2	1
15	—	1	2	3	1	—
16	—	—	1	1	4	2
17	—	1	—	7	1	—
18	—	—	—	1	4	2
19	—	—	1	2	3	1
20	—	—	1	2	3	1
21	—	—	—	2	3	2
22	—	—	—	4	5	6
23	—	—	—	1	3	1
24	—	—	—	3	2	3
25	—	—	1	—	2	1
26	—	—	—	—	3	—
27	—	—	—	—	3	1
28	—	—	—	—	6	2
29	—	—	—	—	5	4
30	—	—	—	—	4	4
31	—	—	—	—	1	<b>1</b>
32	—	—	—	—	1	<b>1</b>
33	—	—	—	—	5	2
34	—	—	—	—	—	2
35	—	—	—	—	<b>1</b>	—
36	—	—	—	—	1	3
37	—	—	—	—	1	<b>1</b>
38	—	—	—	—	2	—
39	—	—	—	—	—	—
40	—	—	—	—	2	—
41	—	—	—	—	1	<b>1</b>
42	—	—	—	—	—	1
43	—	—	—	—	—	—
44	—	—	—	—	—	2
45	—	—	—	—	1	—
-51-	—	—	—	—	1	—
Totals	114	86	95	71	92	49
Medians	0.8	3.5	6.2	12.5	22.8	26.0

TABLE 19.

Showing the extremes and medians of abilities among pupils of the same grade as measured by the Ability Tests G-1, G-2, G-3, G-4, G-5, G-6, and G-7. Winchester Schools, Grades one to eight.

Tests	Scores	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
G-1	Lowest	1	14	15	17				
	Highest	42	47	47	56				
	Median	16	32	34	38				
G-2	Lowest	1	7	10	15				
	Highest	30	28	31	32				
	Median	12	18	23	26				
G-3	Lowest	1	2	5	2				
	Highest	40	39	44	48				
	Median	18	22	31	34				
G-4	Lowest	—	—	23	31	31	55		
	Highest	—	—	78	91	110	106		
	Median	—	—	43	60	70	81		
G-5	Lowest	—	—	—	17	19	50	51	50
	Highest	—	—	—	68	71	88	84	76
	Median	—	—	—	39	44	55	61	67
G-6	Lowest	—	—	—	—	—	24	20	24
	Highest	—	—	—	—	—	51	55	54
	Median	—	—	—	—	—	36	41	40
G-7	Lowest	—	—	—	—	—	24	15	31
	Highest	—	—	—	—	—	89	124	105
	Median	—	—	—	—	—	50	68	67
Same for Arithmetic.									
Addition	Lowest	—	—	0	0	0	0	0	0
	Highest	—	—	6	6	8	11	8	12
	Median	—	—	0.7	1.6	2.6	4.0	4.4	5
Subtraction	Lowest	—	—	0	0	0	0	0	1
	Highest	—	—	4	6	9	11	15	14
	Median	—	—	0.5	0.9	2.0	4.3	5.7	8.7

Multipli- cation	Lowest	-	-	0	0	0	0	0	1
	Highest	-	-	1	5	7	11	12	11
	Median	-	-	0.5	0.9	1.8	4.0	6.4	6.9
Division	Lowest	-	-	0	0	0	0	0	0
	Highest	-	-	0	2	6	11	18	16
	Median	-	-	0.0	0.6	0.9	4.2	7.0	7.7
Arith. Totals	Lowest	-	-	0	0	0	0	2	3
	Highest	-	-	10	17	25	24	51	44
	Median	-	-	0.8	3.5	6.2	14.0	22.8	26.0
Same for Reading.									
Reading Compre- hension	Lowest	-	-	0	0	2	4	2	8
	Highest	-	-	14	27	27	39	46	42
	Median	-	-	3.2	10.4	13.0	18.0	25.3	21.1
Reading Amount	Lowest	-	-	0	0	15	54	54	31
	Highest	-	-	87	127	141	146	146	146
	Median	-	-	31	67	76	98	119	98

TABLE 20.

Showing certain facts concerning the pupils of Grades 1-4 of the Winchester Schools according to their scores on Test G-1.

Grade 1: 112 pupils.	
Median score .....	16
Lowest score .....	1
Highest score .....	42
Number at or above the median score for grade 2 .....	11
Number at or above the median score for grade 3 .....	8
Number at or above the median score for grade 4 .....	5
Per cent at or above the median score for grade 2 .....	10
Per cent at or above the median score for grade 3 .....	7
Per cent at or above the median score for grade 4 .....	5
Grade 2: 104 pupils.	
Median score .....	22
Lowest score .....	13
Highest score .....	47
Number at or below the median score for grade 1 .....	4
Number at or above the median score for grade 3 .....	8
Number at or above the median score for grade 4 .....	19
Per cent at or below the median score for grade 1 .....	4
Per cent at or above the median score for grade 3 .....	7
Per cent at or above the median score for grade 4 .....	18
Grade 3: 117 pupils.	
Median score .....	34
Lowest score .....	15
Highest score .....	47
Number at or below the median score for grade 1 .....	1
Number at or below the median score for grade 2 .....	54
Number at or above the median score for grade 4 .....	31
Per cent at or below the median score for grade 1 .....	1
Per cent at or below the median score for grade 2 .....	46
Per cent at or above the median score for grade 4 .....	27
Grade 4: 91 pupils.	
Median score .....	38
Lowest score .....	17
Highest score .....	56
Number at or below the median score for grade 1 .....	0
Number at or below the median score for grade 2 .....	17
Number at or below the median score for grade 3 .....	68
Per cent at or below the median score for grade 1 .....	0
Per cent at or below the median score for grade 2 .....	18
Per cent at or below the median score for grade 3 .....	74

This test is designed primarily for pupils in grades 1-4.

TABLE 21.

Showing certain facts concerning the pupils of Grades 1-4 of the Winchester Schools according to their scores on Test G-2.

Grade 1: 109 pupils.	
Median score .....	12
Lowest score .....	1
Highest score .....	30
Number at or above the median score for grade 2.....	24
Number at or above the median score for grade 3.....	3
Number at or above the median score for grade 4.....	2
Per cent at or above the median score for grade 2.....	22
Per cent at or above the median score for grade 3.....	3
Per cent at or above the median score for grade 4.....	2
Grade 2: 94 pupils.	
Median score .....	17
Lowest score .....	7
Highest score .....	28
Number at or below the median score for grade 1.....	16
Number at or above the median score for grade 3.....	13
Number at or above the median score for grade 4.....	4
Per cent at or below the median score for grade 1.....	17
Per cent at or above the median score for grade 3.....	13
Per cent at or above the median score for grade 4.....	4
Grade 3: 115 pupils.	
Median score .....	23
Lowest score .....	10
Highest score .....	31
Number at or below the median score for grade 1.....	6
Number at or below the median score for grade 2.....	24
Number at or above the median score for grade 4.....	24
Per cent at or below the median score for grade 1.....	5
Per cent at or below the median score for grade 2.....	21
Per cent at or above the median score for grade 4.....	21
Grade 4: 91 pupils.	
Median score .....	26
Lowest score .....	15
Highest score .....	32
Number at or below the median score for grade 1.....	1
Number at or below the median score for grade 2.....	3
Number at or below the median score for grade 3.....	30
Per cent at or below the median score for grade 1.....	1
Per cent at or below the median score for grade 2.....	3
Per cent at or below the median score for grade 3.....	33

This test is designed primarily for pupils in grades 1-3.

TABLE 22.

Showing certain facts concerning the pupils of Grades 1-4 of the Winchester Schools according to their scores on Test G-2.

Grade 1: 111 pupils.	
Median score .....	18
Lowest score .....	1
Highest score .....	40
Number at or above the median score for grade 2 .....	28
Number at or above the median score for grade 3 .....	12
Number at or above the median score for grade 4 .....	5
Per cent at or above the median score for grade 2 .....	25
Per cent at or above the median score for grade 3 .....	11
Per cent at or above the median score for grade 4 .....	5
Grade 2: 100 pupils.	
Median score .....	22
Lowest score .....	2
Highest score .....	39
Number at or below the median score for grade 1 .....	18
Number at or above the median score for grade 3 .....	20
Number at or above the median score for grade 4 .....	11
Per cent at or below the median score for grade 1 .....	38
Per cent at or above the median score for grade 3 .....	20
Per cent at or above the median score for grade 4 .....	11
Grade 3: 117 pupils.	
Median score .....	30
Lowest score .....	5
Highest score .....	44
Number at or below the median score for grade 1 .....	17
Number at or below the median score for grade 2 .....	27
Number at or above the median score for grade 4 .....	8
Per cent at or below the median score for grade 1 .....	15
Per cent at or below the median score for grade 2 .....	23
Per cent at or above the median score for grade 4 .....	6
Grade 4: 94 pupils.	
Median score .....	34
Lowest score .....	2
Highest score .....	48
Number at or below the median score for grade 1 .....	8
Number at or below the median score for grade 2 .....	11
Number at or below the median score for grade 3 .....	31
Per cent at or below the median score for grade 1 .....	9
Per cent at or below the median score for grade 2 .....	12
Per cent at or below the median score for grade 3 .....	33

This test is designed primarily for pupils in grades 1-3.

TABLE 23.

Showing certain facts concerning pupils in grades 3-6 of the Winchester Schools according to their scores on Test G-4.

## Grade 3: 110 pupils.

Median score .....	43
Lowest score .....	23
Highest score .....	78
Number at or above the median score for grade 4.....	9
Number at or above the median score for grade 5.....	3
Number at or above the median score for grade 6.....	0
Per cent at or above the median score for grade 4.....	8
Per cent at or above the median score for grade 5.....	3
Per cent at or above the median score for grade 6.....	0

## Grade 4: 92 pupils.

Median score .....	60
Lowest score .....	31
Highest score .....	91
Number at or below the median score for grade 3.....	10
Number at or above the median score for grade 5.....	23
Number at or above the median score for grade 6.....	4
Per cent at or below the median score for grade 3.....	11
Per cent at or above the median score for grade 5.....	30
Per cent at or above the median score for grade 6.....	4

## Grade 5: 99 pupils.

Median score .....	70
Lowest score .....	31
Highest score .....	110
Number at or below the median score for grade 3.....	2
Number at or below the median score for grade 4.....	24
Number at or above the median score for grade 6.....	13
Per cent at or below the median score for grade 3.....	2
Per cent at or below the median score for grade 4.....	24
Per cent at or above the median score for grade 6.....	13

## Grade 6: 86 pupils.

Median score .....	81
Lowest score .....	53
Highest score .....	106
Number at or below the median score for grade 3.....	0
Number at or below the median score for grade 4.....	5
Number at or below the median score for grade 5.....	18
Per cent at or below the median score for grade 3.....	0
Per cent at or below the median score for grade 4.....	6
Per cent at or below the median score for grade 5.....	21



TABLE 24.

Showing certain facts concerning pupils in grades 4-8 of the Winchester Schools according to their scores on Test G-5

## Grade 4: 88 pupils.

Median score .....	69
Lowest score .....	17
Highest score .....	68
Number at or above the median score for grade 5.....	32
Number at or above the median score for grade 6.....	5
Number at or above the median score for grade 7.....	2
Number at or above the median score for grade 8.....	1
Per cent at or above the median score for grade 5.....	36
Per cent at or above the median score for grade 6.....	6
Per cent at or above the median score for grade 7.....	2
Per cent at or above the median score for grade 8.....	1

## Grade 5: 99 pupils.

Median score .....	43
Lowest score .....	19
Highest score .....	71
Number at or below the median score for grade 4.....	34
Number at or above the median score for grade 6.....	20
Number at or above the median score for grade 7.....	7
Number at or above the median score for grade 8.....	2
Per cent at or below the median score for grade 4.....	34
Per cent at or above the median score for grade 6.....	20
Per cent at or above the median score for grade 7.....	7
Per cent at or above the median score for grade 8.....	2

## Grade 6: 85 pupils.

Median score .....	55
Lowest score .....	30
Highest score .....	88
Number at or below the median score for grade 4.....	4
Number at or below the median score for grade 5.....	1
Number at or above the median score for grade 7.....	17
Number at or above the median score for grade 8.....	13
Per cent at or below the median score for grade 4.....	5
Per cent at or below the median score for grade 5.....	1
Per cent at or above the median score for grade 7.....	20
Per cent at or above the median score for grade 8.....	15

## Grade 7: 90 pupils.

Median score .....	61
Lowest score .....	31
Highest score .....	84
Number at or below the median score for grade 4.....	4
Number at or below the median score for grade 5.....	5
Number at or below the median score for grade 6.....	1

Number at or above the median score for grade 8.....	41
Per cent at or below the median score for grade 4.....	4
Per cent at or below the median score for grade 5.....	8
Per cent at or below the median score for grade 6.....	36
Per cent at or above the median score for grade 8.....	46
Grade 8: 45 pupils.	
Median score .....	67
Lowest score .....	30
Highest score .....	76
Number at or below the median score for grade 4.....	1
Number at or below the median score for grade 5.....	2
Number at or below the median score for grade 6.....	10
Number at or below the median score for grade 7.....	18
Per cent at or below the median score for grade 4.....	2
Per cent at or below the median score for grade 5.....	4
Per cent at or below the median score for grade 6.....	21
Per cent at or below the median score for grade 7.....	38

TABLE 25.

Showing certain facts concerning pupils in grades 6-8 of the Winchester Schools according to their scores in Test G-6.

Grade 6: 82 pupils.	
Median score .....	36
Lowest score .....	24
Highest score .....	53
Number at or above the median score for grade 7.....	26
Number at or above the median score for grade 8.....	31
Per cent at or above the median score for grade 7.....	32
Per cent at or above the median score for grade 8.....	38
Grade 7: 90 pupils.	
Median score .....	41
Lowest score .....	20
Highest score .....	53
Number at or below the median score for grade 6.....	22
Number at or above the median score for grade 8.....	51
Per cent at or below the median score for grade 6.....	24
Per cent at or above the median score for grade 8.....	57
Grade 8: 46 pupils.	
Median score .....	40
Lowest score .....	24
Highest score .....	54
Number at or below the median score for grade 6.....	17
Number at or below the median score for grade 7.....	29
Per cent at or below the median score for grade 6.....	35
Per cent at or below the median score for grade 7.....	60

TABLE 26.

Showing certain facts concerning pupils in grades 6-8 of the Winchester Schools according to their scores on Test G-7.

## Grade 6: 83 pupils.

Median score .....	50
Lowest score .....	22
Highest score .....	89
Number at or above the median score for Grade 7 .....	15
Number at or above the median score for Grade 8 .....	17
Per cent at or above the median score for Grade 7 .....	18
Per cent at or above the median score for Grade 8 .....	20

## Grade 7: 91 pupils.

Median score .....	68
Lowest score .....	15
Highest score .....	121
Number at or below the median score for Grade 6 .....	13
Number at or above the median score for Grade 8 .....	50
Per cent at or below the median score for Grade 6 .....	14
Per cent at or above the median score for Grade 8 .....	55

## Grade 8: 48 pupils.

Median score .....	67
Lowest score .....	31
Highest score .....	105
Number at or below the median score for Grade 6 .....	5
Number at or below the median score for Grade 7 .....	24
Per cent at or below the median score for Grade 6 .....	10
Per cent at or below the median score for Grade 7 .....	50

TABLE 27.

Showing certain facts concerning the pupils of grades 3-8 in the Winchester Schools according to their scores in the Monroe Reading Test.

## Grade 3: 114 pupils.

	Compre- hension	Amount read
Median score .....	3.2	31
Lowest score .....	0	0
Highest score .....	14	87
Number at or above the median score for Grade 4..	6	11
Number at or above the median score for Grade 5..	2	5
Number at or above the median score for Grade 6..	0	0
Number at or above the median score for Grade 7..	0	0
Number at or above the median score for Grade 8..	0	0
Per cent at or above the median score for Grade 4..	5	10
Per cent at or above the median score for Grade 5..	2	5
Per cent at or above the median score for Grade 6..	0	0
Per cent at or above the median score for Grade 7..	0	0
Per cent at or above the median score for Grade 8..	0	0

## Grade 4: 88 pupils.

Median score .....	10.4	67
Lowest score .....	0	0
Highest score .....	27	127
Number at or below the median score for Grade 3..	8	4
Number at or above the median score for Grade 5..	27	37
Number at or above the median score for Grade 6..	8	17
Number at or above the median score for Grade 7..	1	2
Number at or above the median score for Grade 8..	2	17
Per cent at or below the median score for Grade 3..	9	5
Per cent at or above the median score for Grade 5..	31	42
Per cent at or above the median score for Grade 6..	9	19
Per cent at or above the median score for Grade 7..	1	2
Per cent at or above the median score for Grade 8..	2	19

## Grade 5: 96 pupils.

Median score .....	13	76
Lowest score .....	2	15
Highest score .....	27	141
Number at or below the median score for Grade 3..	1	2
Number at or below the median score for Grade 4..	28	40
Number at or above the median score for Grade 6..	17	27
Number at or above the median score for Grade 7..	1	5
Number at or above the median score for Grade 8..	8	27
Per cent at or below the median score for Grade 3..	1	2
Per cent at or below the median score for Grade 4..	29	41
Per cent at or above the median score for Grade 6..	17	28

	Compre- hension	Amount read
Per cent at or above the median score for Grade 7...	1	7
Per cent at or above the median score for Grade 8...	8	28
Grade 6: 84 pupils.		
Median score .....	18	98
Lowest score .....	4	54
Highest score .....	39	146
Number at or below the median score for Grade 3...	0	0
Number at or below the median score for Grade 4...	7	7
Number at or below the median score for Grade 5...	20	12
Number at or above the median score for Grade 7...	15	2
Number at or above the median score for Grade 8...	24	17
Per cent at or below the median score for Grade 3...	0	0
Per cent at or below the median score for Grade 4...	8	8
Per cent at or below the median score for Grade 5...	29	14
Per cent at or above the median score for Grade 7...	18	27
Per cent at or above the median score for Grade 8...	29	56
Grade 7: 89 pupils.		
Median score .....	25.3	119
Lowest score .....	2	54
Highest score .....	46	146
Number at or below the median score for Grade 3...	1	0
Number at or below the median score for Grade 4...	3	4
Number at or below the median score for Grade 5...	7	7
Number at or below the median score for Grade 6...	21	1
Number at or above the median score for Grade 8...	59	50
Per cent at or below the median score for Grade 3...	1	0
Per cent at or below the median score for Grade 4...	3	4
Per cent at or below the median score for Grade 5...	9	9
Per cent at or below the median score for Grade 6...	24	15
Per cent at or above the median score for Grade 8...	66	78
Grade 8: 47 pupils.		
Median score .....	21.1	98
Lowest score .....	8	54
Highest score .....	42	146
Number at or below the median score for Grade 3...	0	0
Number at or below the median score for Grade 4...	1	2
Number at or below the median score for Grade 5...	3	7
Number at or below the median score for Grade 6...	12	27
Number at or below the median score for Grade 7...	34	8
Per cent at or below the median score for Grade 4...	0	2
Per cent at or below the median score for Grade 5...	2	4
Per cent at or below the median score for Grade 6...	6	15
Per cent at or below the median score for Grade 7...	25	58
Per cent at or below the median score for Grade 7...	70	84

TABLE 28.

Showing certain facts concerning the pupils in Grades 3-8 of the Winchester Schools according to their scores on Courtis Arithmetic Tests.

## Grade 3: 114 pupils.

	Addi- tion	Sub- trac- tion	Multi- plica- tion	Divi- sion	Aggre- gate
Median score .....	0.7	0.5	0.5	0.0	0.8
Lowest score .....	0	0	0	0	0
Highest score .....	6	4	1	0	10
No. at or above the median score for Grade 4....	18	7	3	0	5
No. at or above the median score for Grade 5....	6	3	0	0	2
No. at or above the median score for Grade 6....	3	0	0	0	0
No. at or above the median score for Grade 7....	2	0	0	0	0
No. at or above the median score for Grade 8....	1	0	0	0	0
Per cent at or above the median score for Grade 4..	16	6	3	0	4
Per cent at or above the median score for Grade 5..	5	3	0	0	2
Per cent at or above the median score for Grade 6..	3	0	0	0	0
Per cent at or above the median score for Grade 7..	3	0	0	0	0
Per cent at or above the median score for Grade 8..	1	0	0	0	0

## Grade 4: 88 pupils.

Median score .....	1.6	0.9	0.9	0.6	3.5
Lowest score .....	0	0	0	0	0
Highest score .....	6	6	5	2	17
No. at or below median score for Grade 3.....	30	48	50	76	10
No. at or above median score for Grade 5.....	24	18	15	14	16
No. at or above median score for Grade 6....	10	5	6	0	2
No. at or above median score for Grade 7....	4	3	0	0	0
No. at or above median score for Grade 8....	3	0	0	0	0
Per cent at or below median score for Grade 3..	34	55	57	86	12
Per cent at or above median score for Grade 5..	27	20	17	16	18
Per cent at or above median score for Grade 6..	12	6	7	0	2
Per cent at or above median score for Grade 7..	5	4	0	0	0
Per cent at or above median score for Grade 8..	4	0	0	0	0

## Grade 5: 95 pupils.

Median score .....	2.6	2.0	1.8	0.9	6.2
Lowest score .....	0	0	0	0	0
Highest score .....	8	9	7	3	25
No. at or below median score for Grade 3.....	22	26	29	56	8
No. at or below median score for Grade 4.....	34	26	29	56	27
No. at or above median score for Grade 6.....	18	9	11	1	9
No. at or above median score for Grade 7.....	11	6	1	0	1
No. at or above median score for Grade 8.....	4	1	1	0	0
Per cent at or below median score for Grade 3..	23	27	31	59	8
Per cent at or below median score for Grade 4..	36	27	31	59	29
Per cent at or above median score for Grade 6..	19	9	12	1	9
Per cent at or above median score for Grade 7..	12	6	1	0	1
Per cent at or above median score for Grade 8..	4	1	1	0	0

## Grade 6: 83 pupils.

	Addi- tion	Sub- trac- tion	Multi- plica- tion	Divi- sion	Average
Median score .....	4.0	4.4	4.0	4.2	14.0
Lowest score .....	0	0	0	0	0
Highest score .....	11	20	11	11	41
No. at or below median score for Grade 3.....	13	8	7	16	4
No. at or below median score for Grade 4.....	23	8	7	16	10
No. at or below median score for Grade 5.....	33	25	21	16	20
No. at or above median score for Grade 7.....	22	26	10	17	16
No. at or above median score for Grade 8.....	13	10	10	11	12
Per cent at or below median score for Grade 3..	16	10	8	19	5
Per cent at or below median score for Grade 4..	27	10	8	19	12
Per cent at or below median score for Grade 5..	40	30	25	19	24
Per cent at or above median score for Grade 7..	26	31	12	20	19
Per cent at or above median score for Grade 8..	16	12	12	14	6

## Grade 7: 91 pupils.

Median score .....	4.4	5.7	6.4	7.0	22.8
Lowest score .....	0	0	0	0	2
Highest score .....	8	15	12	18	51
No. at or below median score for Grade 3.....	9	7	3	6	0
No. at or below median score for Grade 4.....	15	7	3	6	3
No. at or below median score for Grade 5.....	23	21	6	6	5
No. at or below median score for Grade 6.....	47	35	25	36	23
No. at or above median score for Grade 8.....	26	22	37	10	38
Per cent at or below median score for Grade 3..	9	7	3	6	0
Per cent at or below median score for Grade 4..	16	7	3	6	3
Per cent at or below median score for Grade 5..	25	23	6	6	5
Per cent at or below median score for Grade 6..	52	38	27	39	25
Per cent at or above median score for Grade 8..	28	24	40	11	41

## Grade 8: 49 pupils.

Median score .....	5.3	8.7	6.9	7.7	26.0
Lowest score .....	0	1	1	0	3
Highest score .....	12	14	11	16	44
No. at or below median score for Grade 3.....	2	0	0	2	0
No. at or below median score for Grade 4.....	5	0	0	2	1
No. at or below median score for Grade 5.....	11	3	1	2	1
No. at or below median score for Grade 6.....	23	7	11	13	5
No. at or below median score for Grade 7.....	23	15	26	28	19
Per cent at or below median score for Grade 3..	4	0	0	4	0
Per cent at or below median score for Grade 4..	10	0	0	4	2
Per cent at or below median score for Grade 5..	22	6	9	4	2
Per cent at or below median score for Grade 6..	47	14	22	26	10
Per cent at or below median score for Grade 7..	47	26	53	57	38

TABLE 29.

Showing for each test the numbers and per cents of pupils at or below the medians for one, two, three, four, or five grades below the grades in which the pupils are, and also the numbers and per cents of pupils at or above the medians for one, two, three, four, and five grades above the grades in which pupils are.

Total Num- ber of pupils con- cerned	Test	Number of pupils at or below the medians for grades 1, 2, 3, 4, or 5 grades below					Number of pupils at or above the medians for grades 1, 2, 3, 4, or 5 grades above					Number of pupils between median for grade below and that for grade above
		1	2	3	4	5	1	2	3	4	5	
124	G-1	126	18	0	—	—	75	26	5	—	—	223
424	G-2	74	9	4	—	—	61	7	2	—	—	293
124	G-3	86	38	8	—	—	81	23	5	—	—	257
387	G-4	52	7	0	—	—	45	7	0	—	—	290
407	G-5	98	24	6	1	—	120	25	4	1	—	189
218	G-6	39	29	—	—	—	77	31	—	—	—	102
222	G-7	37	5	—	—	—	65	17	—	—	—	120
520	Addition	167	91	39	14	2	108	40	11	5	1	245
520	Sub'tion	147	62	18	7	0	82	24	4	0	0	291
520	Mul'tion	151	53	11	3	0	76	17	1	0	0	293
520	Division	212	91	24	8	2	72	11	0	0	0	236
520	Arth'tic	99	28	8	1	0	84	17	0	0	0	337
548	Reading Compre-											
	hension	110	27	6	2	0	124	35	9	2	0	286
548	Reading Amount	125	43	11	2	1	168	74	29	17	0	227
PER CENT												
424	G-1	29.7	4.2	0.0	—	—	17.7	6.1	1.2	—	—	52.6
424	G-2	16.7	2.1	0.2	—	—	14.4	1.6	0.5	—	—	68.9
424	G-3	20.3	9.0	1.9	—	—	19.1	5.4	1.2	—	—	60.6
387	G-4	13.4	1.8	2.1	—	—	11.6	1.8	0.0	—	—	75.0
407	G-5	24.1	5.2	1.5	0.3	—	29.5	6.1	1.0	0.3	—	46.6
218	G-6	18.0	13.3	—	—	—	35.3	14.2	—	—	—	42.7
222	G-7	16.7	2.3	—	—	—	29.3	7.6	—	—	—	54.0
520	Addition	32.1	17.5	7.5	2.7	0.4	20.7	7.8	2.1	1.0	0.2	47.2
520	Sub'tion	26.4	11.8	3.5	1.4	0.0	15.7	4.6	0.8	0.0	0.0	57.9
520	Mul'tion	29.0	10.2	2.1	0.6	0.0	14.6	3.3	0.2	0.0	0.0	56.4
520	Division	40.8	17.5	7.8	1.6	0.4	13.9	2.1	0.0	0.0	0.0	45.3
520	Arth'tic	19.0	5.4	1.6	0.2	0.0	16.2	3.3	0.0	0.0	0.0	64.8
548	Reading Compre-											
	hension	20.1	5.0	1.1	0.4	0.0	22.6	6.4	1.6	0.4	0.0	57.3
548	Reading Amount	22.7	8.0	2.0	0.4	0.2	30.6	13.5	5.3	3.1	0.0	46.7



Read table as follows: of 124 pupils considered in connection with Test G-1 at or below the medians of the grade below for each class respectively and separately considered were 126 pupils, at or below the median for two grades below their respective grades were 18 pupils; at or below the medians for three grades below were no pupils. At or above the median for the grade one grade above were 75 pupils; at or above the median for the grade two grades above were 26 pupils; at or above the median for the grade three grades above were 5 pupils. Between the medians for the grade one grade below and that for the grade one grade above were 224 pupils, or 52.6 per cent of all.

TABLE 30.

Showing the scores on Test G-1 and on Test G-2 received by first-grade pupils who were judged by the teachers to be of average intelligence—receiving grade C by teachers.

	Numbers whose scores indicated intelligence that of					Total
	Lowest Fifth	2d Fifth	Middle Fifth	4th Fifth	Highest Fifth	
Test G-1 (Numbers)	12	9	8	9	7	45
Test G-2 (Numbers)	8	6	13	8	10	45
Test G-1 (Per Cent)	26.7	20.0	17.8	20.0	15.5	100.0
Test G-2 (Per Cent)	17.8	13.3	28.9	17.8	22.2	100.0

TABLE 31.

Showing the correlation between (a) the intelligence of pupils as measured by the Stanford-Binet Intelligence Tests (given in terms of the Intelligence Quotient (I. Q.)) and (b) the teachers' judgments concerning the pupils' intelligence (given from E lowest to A highest). 130 cases.

Intelligence Quotient	Teachers' judgments					Total
	E	D	C	B	A	
50-55	2	—	—	—	—	2
56-60	1	—	—	1	—	2
61-65	3	3	3	1	1	11
66-70	1	5	2	—	—	8
71-75	2	7	3	1	—	13
76-80	3	4	4	—	—	11
81-85	2	4	7	5	2	20
86-90	1	5	3	3	—	12
91-95	1	4	2	1	1	9
96-100	1	3	2	5	2	13
101-105	—	1	1	1	1	4
106-110	—	2	1	2	1	6
111-115	1	—	1	2	3	7
116-120	—	—	—	2	1	3
121-125	—	—	—	—	2	2
126-130	1	—	—	—	1	2
131-135	—	—	—	2	1	3
136-140	—	—	—	—	—	—
141-145	—	—	—	—	—	—
146-150	—	—	—	—	1	1
151-155	—	—	—	1	—	1
Totals	19	38	29	27	17	130

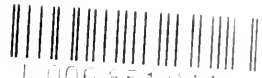
Read as follows: Of pupils having intelligence quotients between .50 and .55 two were judged by teachers to be in the lowest fifth of their classes in intelligence. Of pupils having intelligence quotients between .56 and .60 one was judged by the teacher to belong in the lowest fifth of the class and one was judged by the teacher to belong in the next to the highest fifth. Of eleven pupils who had intelligence quotients between .61 and .65 three were judged to belong to the lowest fifth, three to belong to the next to the lowest fifth, three were judged to belong to the middle fifth, one was judged to belong to the next to the highest fifth, and one was judged to belong to the highest fifth.



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